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IS 9687 (1980): Specification for Inspection Gauges for Checking Type 1 (Size 1) Taper Threads of Gas Cylinder Valves, Taper 1 in !6 [MED 16: Gas Cylinders]

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UDC 621·753·3 : 531·718·451 : 621·646·22 : 621·642·02 ( First Reprint AUGUST 1998 )

IS : 9687 - 1980
( Reaffirmed 2006 )

*Indian Standard*

# SPECIFICATION FOR INSPECTION GAUGES FOR CHECKING TYPE 1 ( SIZE 1 ) TAPER THREADS OF GAS CYLINDER VALVES, TAPER 1 IN 16

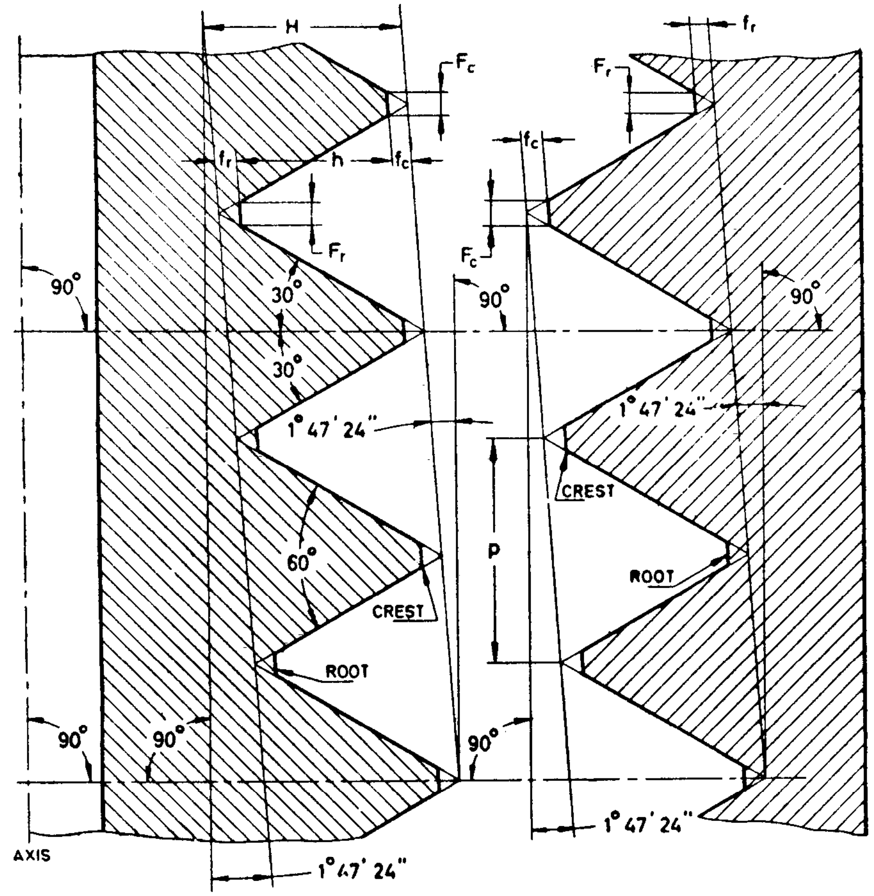
Gas Cylinders Sectional Committee, EDC 16; Gas Cylinders Valves and Fittings ( Including Regulators ) Subcommittee, EDC 16 : 1 [ Ref : Doc : EDC 16 ( 3103 ) ]

**1. Scope** — Prescribes dimensions, tolerances and material requirement of inspection gauges recommended for checking the taper threads on the valve stems and the threads in the cylinder necks of valve fitting conforming to Type 1 ( Size 1 ) of IS : 3224-1979 'Specification for valve fittings for compressed gas cylinders excluding liquefied petroleum gas (LPG) cylinders ( *second revision* )'.

**Note** — This type of thread also conforms to size 1/2″ — 14 NGT of ANSI — B 57·1 Compressed gas cylinder valve outlet and inlet connection. American National Standards Institute.

## 2. Dimensions of Threads on Valve Stems and in Cylinder Necks

### 2.1 *Basic Thread Form*



EXTERNAL THREAD INTERNAL THREAD

Pitch measured parallel to axis, $p = 1{\cdot}814$ mm
Thread angle 60° normal to the axis
Taper 1 in 16 measured on the diameter along the axis
$H = 0{\cdot}866\,025\ P$ = height of 60° sharp V thread = 1·571 22 mm
$h = 0{\cdot}800\,000\ P$ = height of thread on product = 1·451 43 mm
$f_c$* = depth of truncation at crest, $f_r$* = depth of truncation at root
$F_c$ = width of flat at crest, $F_r$* = width of flat at root

**Note** — The thread is same as 1/2″ — 14 National Gas Taper (NGT) threads of ANSI — B 57·1 — 1965.

*For limits *see* **2.3**.

Adopted 13 November 1980
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Gr 6

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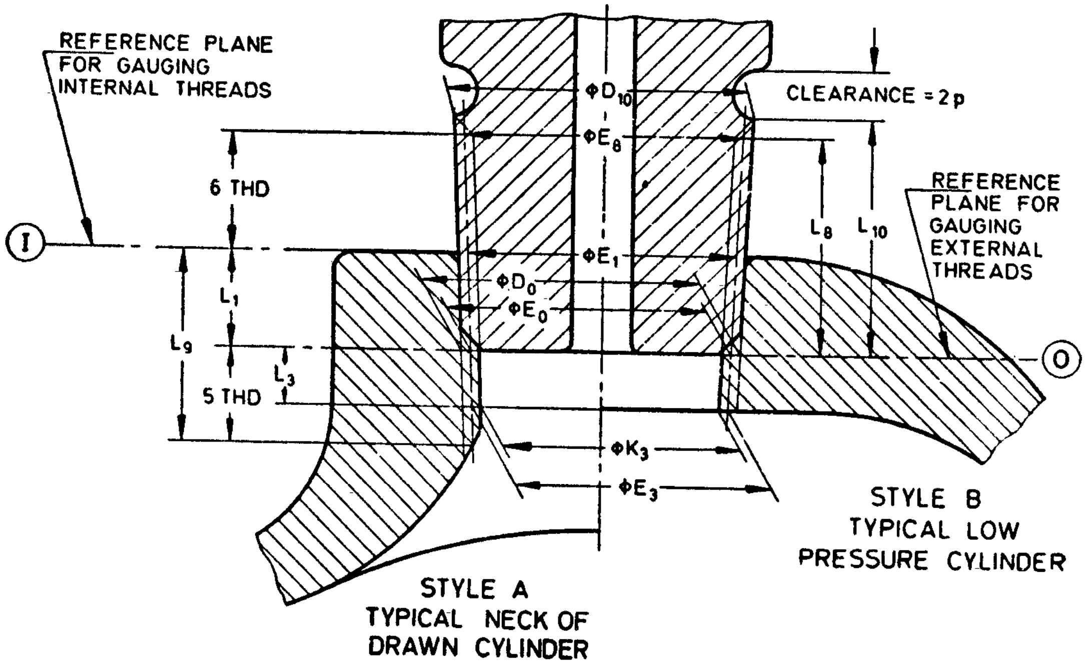
NEW DELHI 110002

### 2.2 *Principal Dimensions*

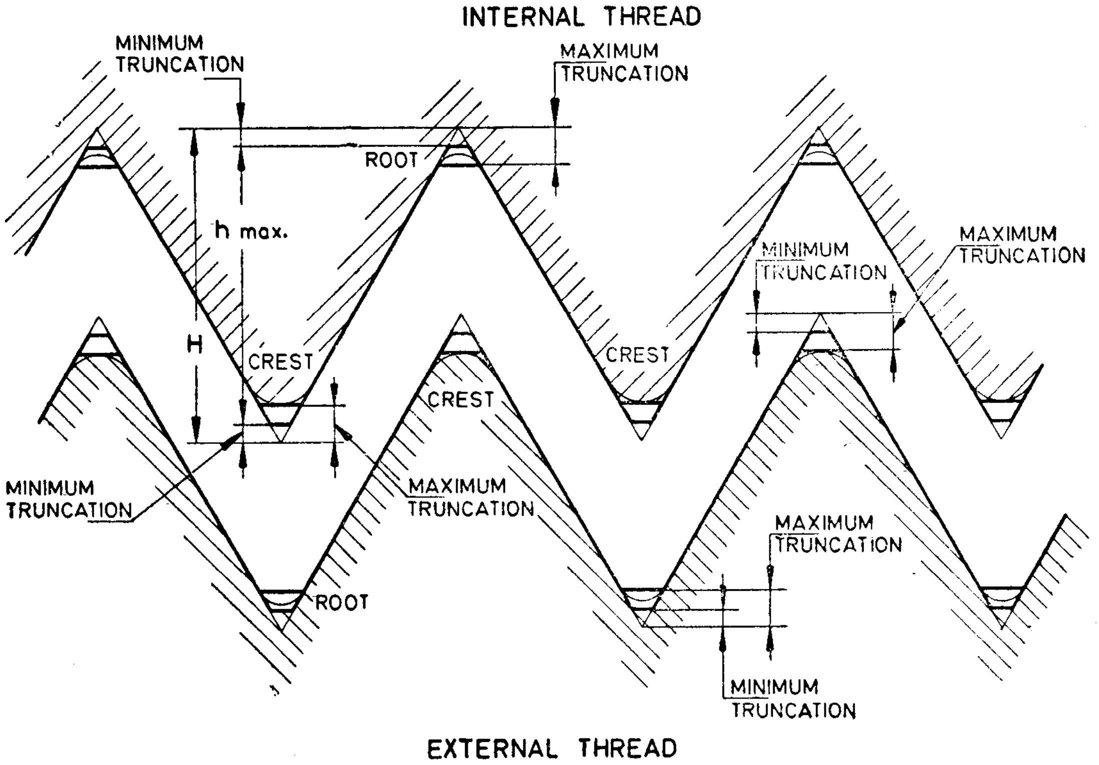
All dimensions in millimetres.


REFERENCE PLANE FOR GAUGING INTERNAL THREADS
ΦD10
CLEARANCE = 2p
ΦE8
6 THD
REFERENCE PLANE FOR GAUGING EXTERNAL THREADS
L8
L10
I
ΦE1
ΦD0
ΦE0
L1
L9
L3
5 THD
O
ΦK3
ΦE3
STYLE B TYPICAL LOW PRESSURE CYLINDER
STYLE A TYPICAL NECK OF DRAWN CYLINDER

$D$ = major diameter
    $D_0$ = 20·716
    $D_{10}$ = 21·9
$E$ = pitch diameter
    $E_0$ = 19·263
    $E_1$ = 19·771
    $E_3$ = 18·923
    $E_8$ = 20·452
$K$ = minor diameter
    $K_3$ = 17·473
$L_1$ = standard handtight engagement = 8·128
$L_3$ = 3 threads ( for wrenching )
$L_1 + L_3$ = 13·571
$L_8$ = length of full external threads = 19·014
$L_9$ = length of full roots ( minimum ) on internal threads = 17·198
$L_{10}$ = overall length of external threads ( approx ) = 19
Minimum diameter at small end of the valve after chamfer = 17·5
Maximum diameter at countersink = 22·5

**2.3** *Limits on Crest and Root Truncation*

All dimensions in millimetres.



$P$ = pitch = 1·814

$H$ = height of sharp V thread = 0·866 025 $P$ = 1·571 22

$h$ = height of thread on product = 1·451 4 *Max*
1·288 0 *Min*

$f$ = truncation on crest and root
$f_{Min}$ 0·033 $P$ = 0·059 87
$f_{Max}$ 0·078 $P$ = 0·141 51
Tolerance = 0·081 64

$F$ = equivalent width of flat
$F_{Min}$ = 0·038 $P$ = 0·068 94
$F_{Max}$ = 0·090 $P$ = 0·163 29
Tolerance = 0·094 35

**2.4** *Limits on Size* — Final inspection limits on size ( pitch diameter ) of both external and internal threads are ± 1 turn from basic, although the preferred working limits are ± 1/2 turn from basic.

**2.5** *Limits on Taper*

a) The taper on pitch elements of external threads shall be 1 in 16 on diameter, with a minus tolerance of 1 turn, but no plus tolerance in gauging.

b) The taper on the pitch elements of internal threads shall be 1 in 16 on diameter, with a plus tolerance of 1 turn but with no minus tolerance in gauging.

**2.6** The tolerance on 60° angle of threads shall be ± 2°.

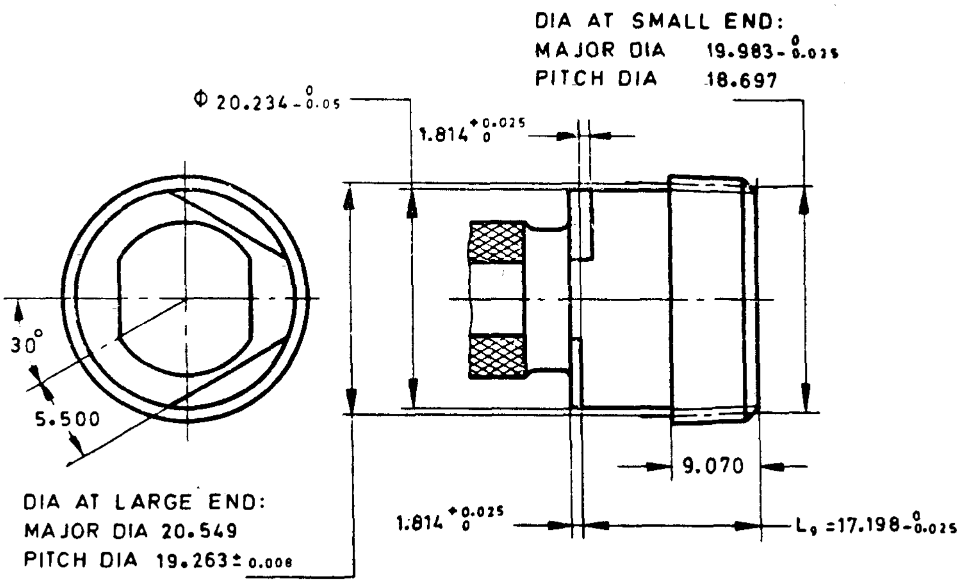
**2.7** The tolerance on lead in length of effective threads shall be ± 0·076 2 mm valid for any size threaded to an effective thread length greater than 25·4 mm.

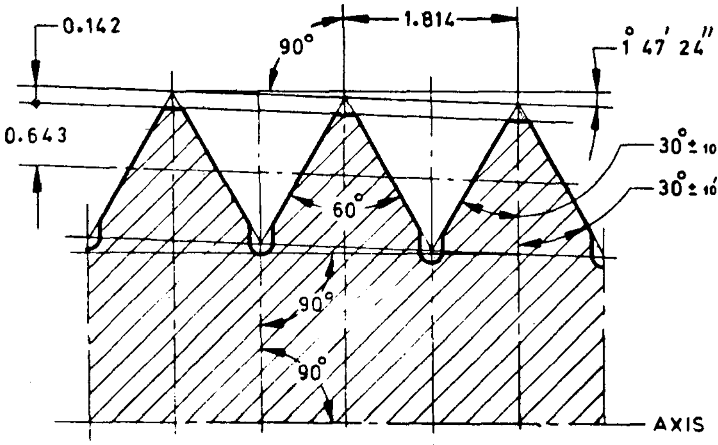
**2.8** The maximum taper on pitch line per millimetre shall be 0·072 9 and the minimum 0·057 3.

## 3. Dimensions and Tolerances of Gauges for Checking Threads in Cylinder Neck

### 3.1 *Full Form Plug Screw Gauge for Checking Thread in Cylinder Neck, $L_9$, Gauge A*

All dimensions in millimetres.





ENLARGED THREAD FORM

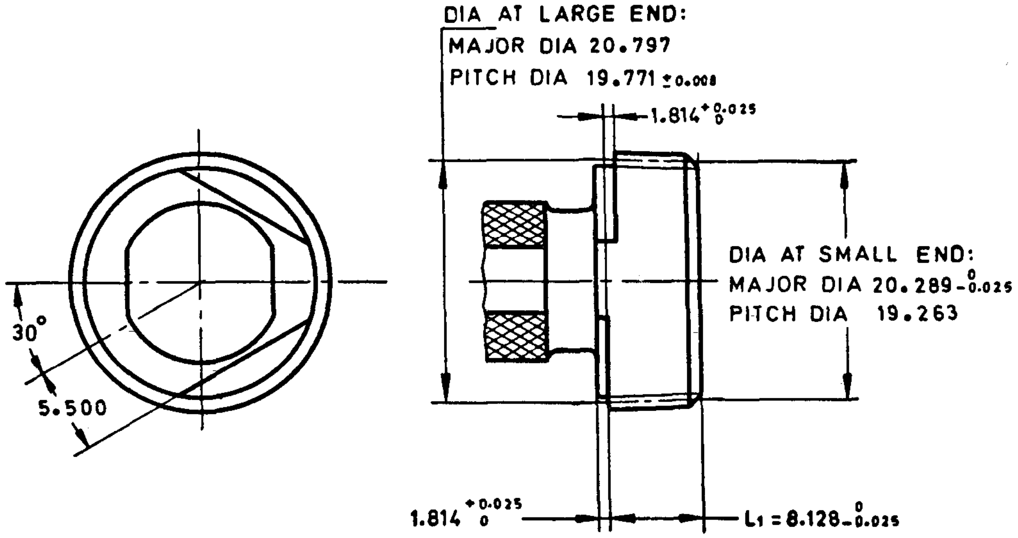
Taper 1 in 16 on diameter

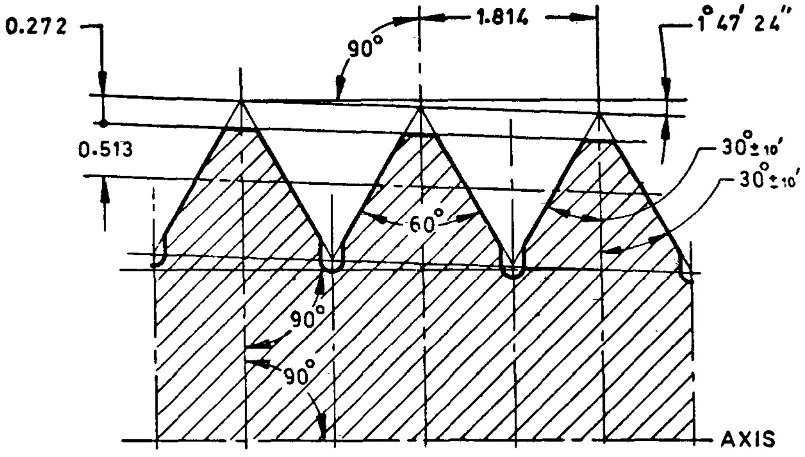
Tolerance on taper in length 9·070 = $^{+0.015}_{0}$

Tolerance on lead in length 9·070 = ± 0·005

### 3.2 *Taper Screw Plug Cauge for Checking Pitch Diameter In Cylinder Neck $L_1$, Gauge B*

All dimensions in millimetres.





ENLARGED THREAD FORM

Taper 1 in 16 on diameter

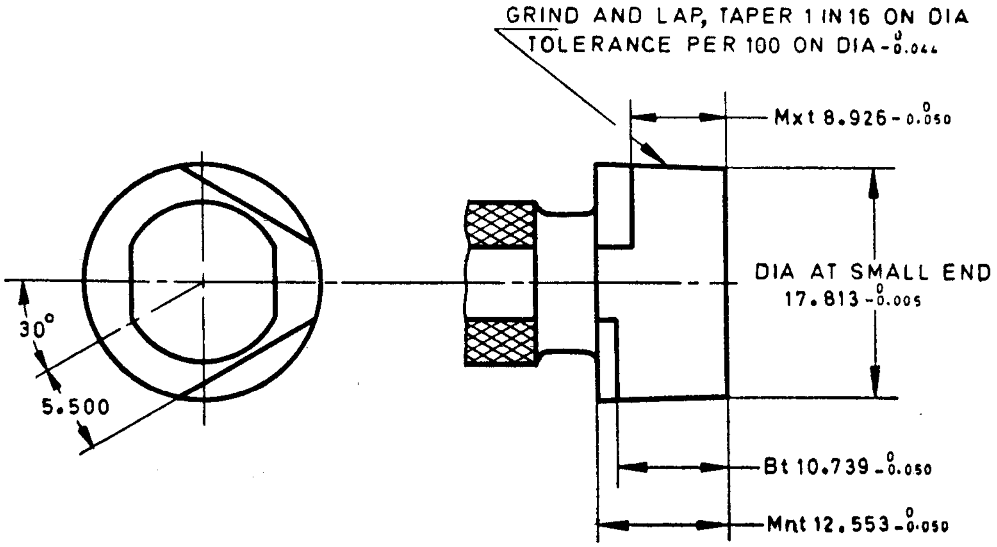
Tolerance in length $L_1 = {}^{+0.015}_{\;\;0}$

Tolerance on lead in length $L_1 = \pm 0.005$.

### 3.3 *Plain Taper Plug Gauge for Checking Crest Truncations of Internal Thread, Gauge C*

#### 3.3.1 *Maximum truncation plain taper plug gauge, gauge $C_1$*

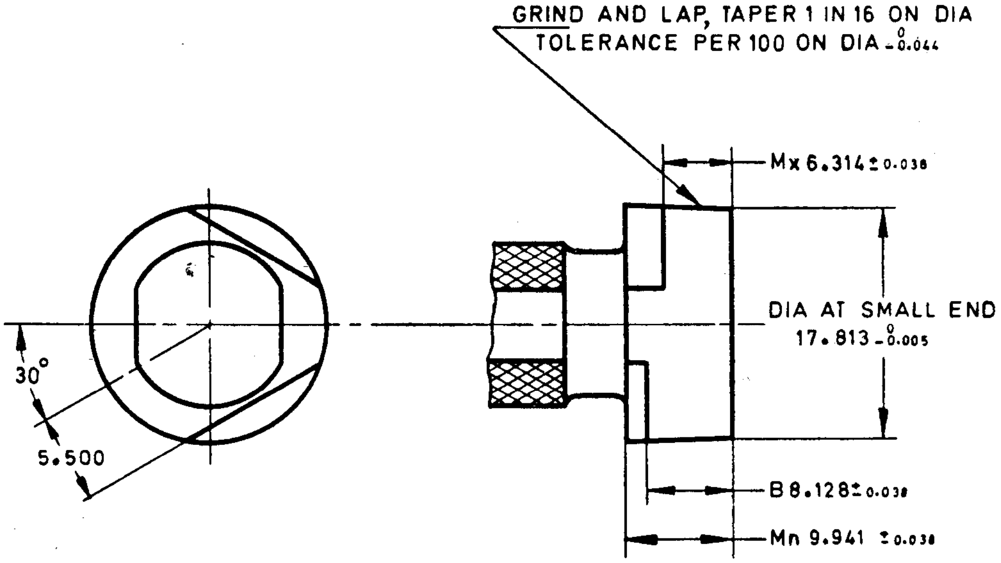
All dimensions in millimetres.


GRIND AND LAP, TAPER 1 IN 16 ON DIA
TOLERANCE PER 100 ON DIA $^{0}_{-0.044}$
Mxt 8.926 $^{0}_{-0.050}$
DIA AT SMALL END
17.813 $^{0}_{-0.005}$
30°
5.500
Bt 10.739 $^{0}_{-0.050}$
Mnt 12.553 $^{0}_{-0.050}$

**Note** — The gauge diameter at the basic step is that minor diameter which corresponds to the maximum crest truncation at plane 1.

#### 3.3.2 *Minimum truncation plain taper plug gauge, gauge $C_2$*

All dimensions in millimetres.

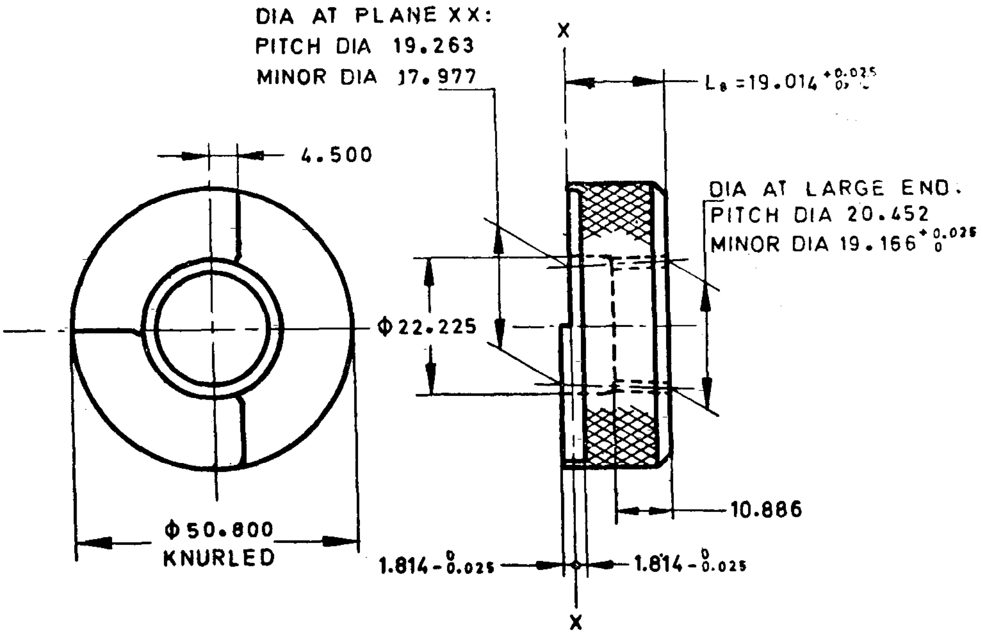


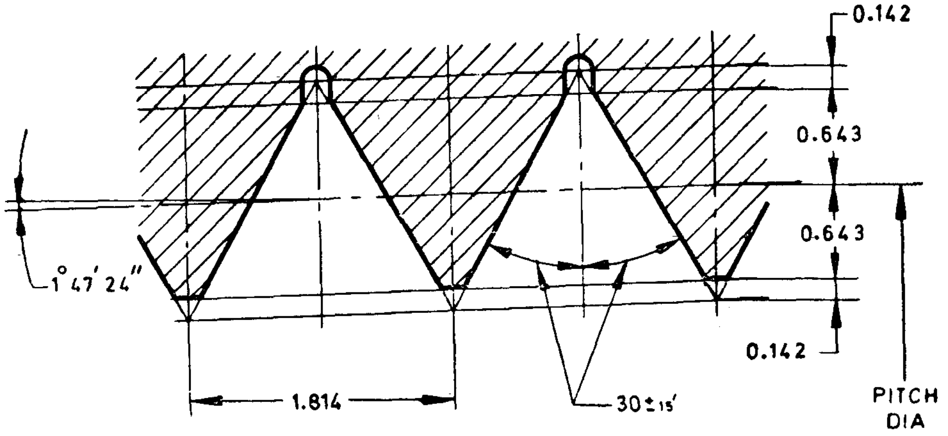
**Note** — The gauge diameter at the basic step is that minor diameter which corresponds to the minimum crest truncation at plane 1.

## 4. Dimensions and Tolerances of Gauges for Checking Threads on Taper Stems

### 4.1 *Full Form Screw Ring Gauge for Checking Thread of Taper Stem $L_8$, Gauge D*

All dimensions in millimetres.





ENLARGED THREAD FORM

Taper 1 in 16 on diameter tolerance in length 10·886 $^{\;\;0}_{-0\cdot023}$

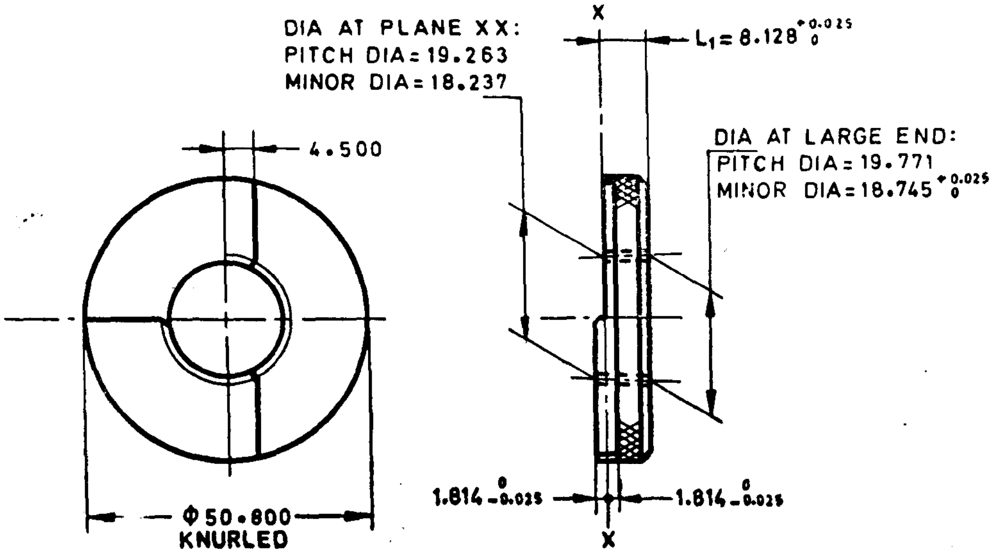
Right hand thread normal to the axis.

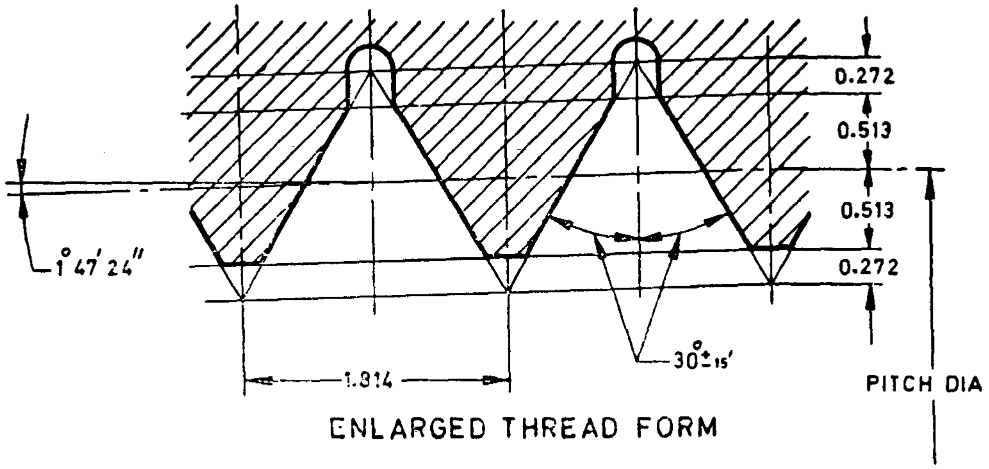
Tolerance on pitch in length 10·886 = 0·008.

**Note** — The large end of the ring is to be flush with the appropriate gauging step of master plug within ± 0·051 when assembled hand tight.

### **4.2** *Ring Screw Gauge for Checking Pitch Diameter of Taper Stem $L_1$, Gauge E*

All dimensions in millimetres.





ENLARGED THREAD FORM

Taper 1 in 16 on diameter tolerance in length $L_1 = {}^{\phantom{-}0}_{-0.023}$

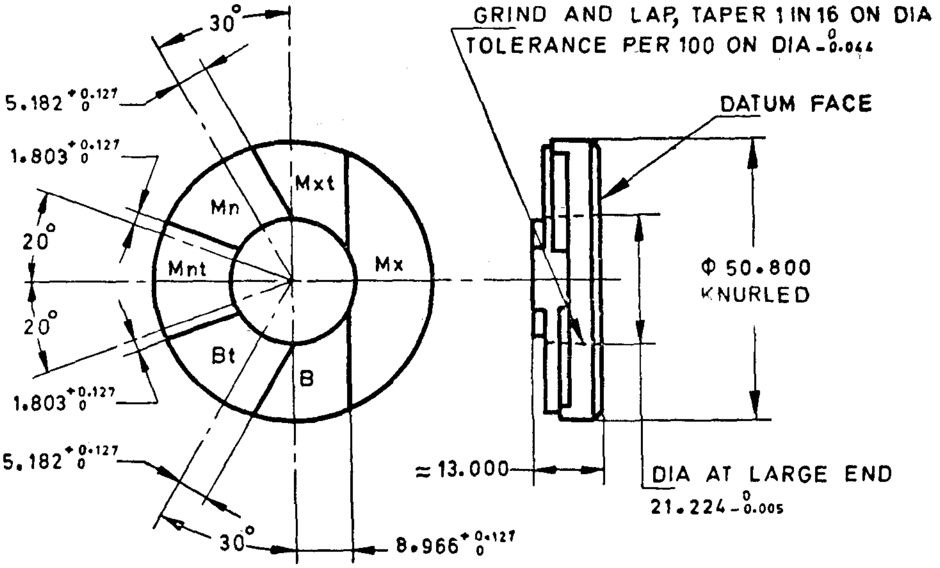
Right hand thread normal to the axis.

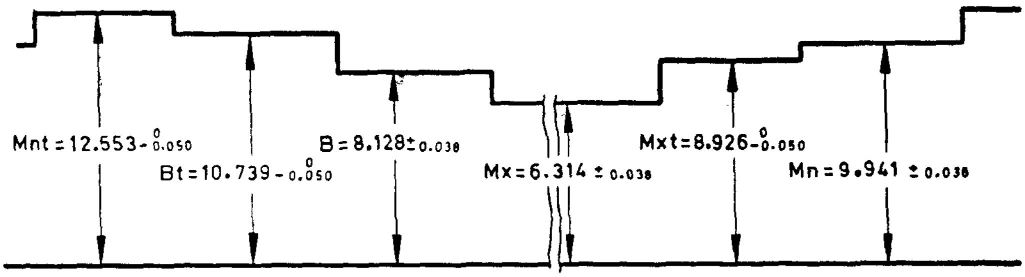
Tolerance on pitch in length $L_1 = 0.008$.

**Note** — The large end of the ring is to be flush with the appropriate gauging step of master plug within ± 0·051 when assembled hand tight.

### 4.3 *Plain Taper Ring Gauge for Checking Crest Truncations of External Threads, Gauge F*

All dimensions in millimetres.





ENLARGED VIEW OF DEVELOPMENT, ANTICLOCKWISE

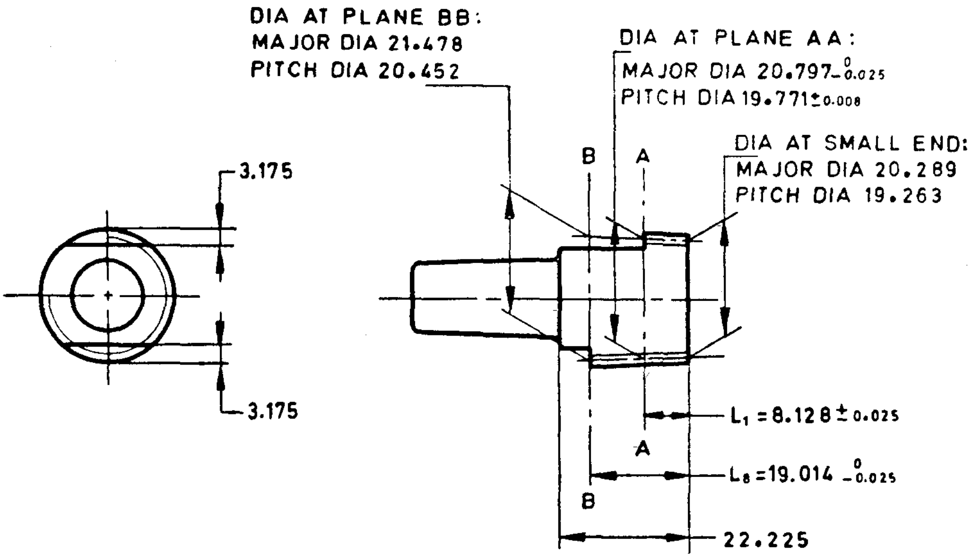
**Note 1** — The inner diameter of the gauge at basic step '*B*' (distance 8·128 mm from datum) is that major diameter which corresponds to minimum crest truncation at plane 1 on the external thread.

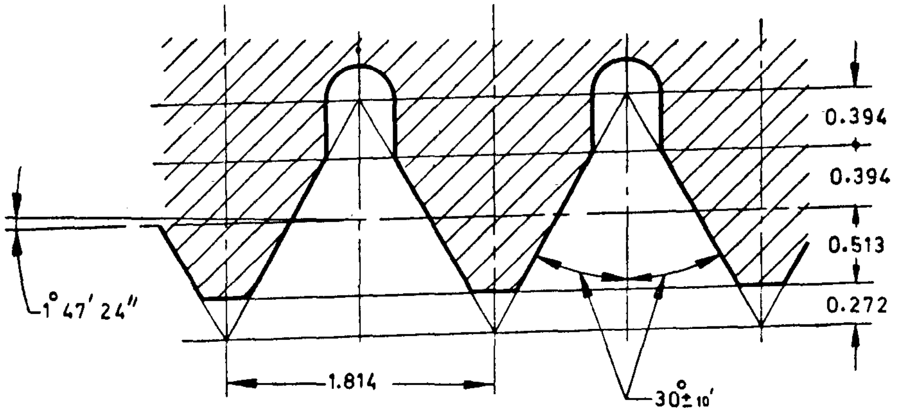
**Note 2** — The inner diameter of the gauge at step '$B_t$' (distance 10·739 mm from datum) is that major diameter which corresponds to maximum crest truncation at plane 1 on the external thread.

## 5. Dimensions and Tolerances on Master Plug Gauges

5.1 *Master Thread Plug Gauge to Check $L_1$ ( Gauge E ) and $L_8$ ( Gauge D ) Screw Ring Gauges, Gauge M*

All dimensions in millimetres.





ENLARGED THREAD FORM

Taper 1 in 16 on diameter

Tolerance in length $L_1 = {}^{+0.015}_{0}$

Right hand thread normal to the axis

Tolerance on pitch in length $L_1$ = ± 0·005

**6. Usage of Gauges** — A description of the usage of the gauges is given in Appendix A.

**7. Material** — Suitable wear resisting steel, for example, 85C6 of IS : 1570 ( Part II )-1979 ‘ Schedules for wrought steels for general engineering purposes: Part II Carbon steel ’ or suitable case hardening steel, for example, 15C4 of IS : 1570 ( Part II )-1979.

## 8. General Requirements of Gauging Surfaces

8.1 *Hardness* — 750 *HV* minimum determined according to IS : 1501-1968 ‘ Method for Vickers hardness test for steel ( *first revision* ) ’ or its equivalent.

**8.2** *Surface Roughness of Gauging Portion* — 0·2 microns ( $R_a$ value ) determined according to IS : 3073-1967 'Specification for assessment of surface roughness'.

**8.3** *Finish* — Ground, lapped and suitably stabilized. Method of stabilizing left to the discretion of the manufacturer. Surfaces other than gauging surface to be finished smooth.

**9. Designation** — The gauges shall be designated by the following:

Gauge type and number of this standard

*Example*:

A screw range gauge for checking pitch diameter of taper stem shall be designated by

Gauge E, IS : 9687

**10. Marking** — The gauge shall be marked with the following:

a) Gauge type and number of this standard,
b) Manufacturer's name or trade-mark, and
c) Serial number.

**10.1** *ISI Certification Marking* — Details available with the Indian Standards Institution.

**11. Corrosion Protection and Packing** — Gauges shall be protected against climatic conditions by applications of any anti-corrosive coating. Packing should be suitable to prevent damage in transit.

## APPENDIX A

( *Clause* 6 )

### USAGE OF GAUGES

**A-0.** Special gauges are required for the gauging of these threads because of their length and the rigid requirement for sealing the compressed gas against leakage.

**A-1. Pitch Diameter of External Thread** — To check the pitch diameter of the external thread, the thread ring gauges *E* and *D* are used. The $L_1$ ring gauge ( Gauge *E* ) is known as a primary gauge because the reading taken on this gauge will be needed for use when additional gauging is done.

The $L_8$ ring gauge ( Gauge *D* ) is screwed on to the valve flat face first. The end of the valve should lie within the topmost and bottom-most notch on the gauge.

Take out the $L_8$ ring gauge and screw in $L_1$ ring gauge. If the end of the valve lies within the topmost and the bottom-most gauging notch, the pitch diameter is acceptable.

Note where the valve and flushes on the $L_1$ ring gauge. It may flush either with the topmost notch or the middle notch or the bottommost notch. It may also lie in between the notches in which case measure the distance from middle ( basic ) notch to the valve end face ( say *x* mm ) which may be either (a) above, or (b) below the basic notch.

**A-2. Crest Truncation of External Thread** — To check the crest truncation of the external thread the gauge *F* is used. The gauge should be placed over the thread.

If the end of the valve in the $L_1$ screw ring gauge above flushed with the bottommost step on the $L_1$ ring gauge, the end should now lie within the step $M_x$ and $M_{xt}$. If the end flushed with the topmost step, it should now lie within the step $M_{xn}$ and $M_{nt}$. If it flushed with the middle step, it should lie within the steps $B$ and $B_t$. If the valve end did not flush with any of the three steps of the $L_1$ screw ring gauge and where the distance from the basic step was measured as described in **A-1**, the valve end should either (a) stand proud of the step $B$ by minimum $x$ mm [ case (a) in **A-1** ] and can extend up to a maximum of $x$ mm above the step $B_t$, or (b) go down from step $B$ by maximum $x$ mm [ case (b) in **A-1** ] and can extend up to a maximum $x$ mm below the step $B_t$.

**A-3. Pitch Diameter of Internal Thread** — To check the pitch diameter of internal thread, the thread plug gauges $B$ and $A$ are used. The $L_1$ screw plug gauge ( Gauge $B$ ) is known as a primary gauge because the reading taken on this gauge will be needed when additional gauging is done.

The $L_9$ plug gauge ( Gauge A ) is screwed into the cylinder. The face of the cylinder should lie within the topmost and bottommost notch of the gauge.

Take out the $L_9$ plug gauge and screw in the $L_1$ plug gauge. If the face of the cylinder lies within the topmost and the bottommost gauging notch, the pitch diameter is acceptable.

Note where the face of the cylinder flushes on the $L_1$ plug gauge. It may flush either on the topmost notch or the middle notch or the bottommost notch. It may also lie in between the notches in which case measure the distance from the middle ( basic ) notch to the face of the cylinder ( say $x$ mm ). It may be either (a) below, or (b) above the basic notch.

**A-4. Crest Truncation of Internal Thread** — To check the crest truncation of internal thread, the gauges $C_1$ and $C_2$ are used.

If the face of the cylinder flushed with the bottommost notch on the $L_1$ plug gauge as described in **A-3**, it should lie within the two bottommost steps of the gauges $C_1$ and $C_2$. If the face of the cylinder flushed with the topmost step, it should lie within the two topmost steps of the gauges $C_1$ and $C_2$. If the cylinder face flushed with the middle step, it should lie within the two middle steps of the gauges $C_1$ and $C_2$. If the face did not flush with any of the three steps of the $L_1$ plug gauge and where the distance from the basic step to cylinder face was measured as described in **A-3**, the face of the cylinder should either (a) go below the basic step by an amount of maximum $x$ mm for gauge $C_2$ and minimum $x$ mm for $C_1$ gauge [ case (a) in **A-3** ], (b) stand proud of the basic step by an amount minimum $x$ mm for gauge $C_2$ and maximum $x$ mm for gauge $C_1$ [ case (b) in **A-3** ].

Printed at New India Printing Press, Khurja, India